TeCKnical Brief

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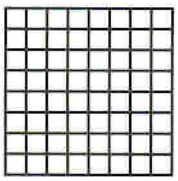
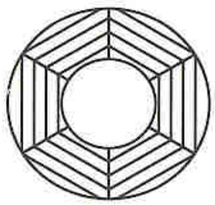
Type 6 Vs Type 7 Rings

Background: The following report is a discussion of the relative characteristics of Type 6 vs. Type 7 rings. Type 6 material is manufactured in Mount Pleasant in sheet form by stacking laminations at 90° to one another. Type 7 is the same material but it is stacked in a pattern so the grain is always tangential. Type 7 rings, on a per pound basis, cost a little more because of the labor required to build each segment, but they can be made with less scrap.

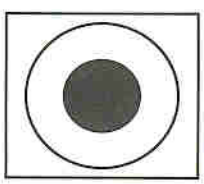


Type 6 (grain at 90°)

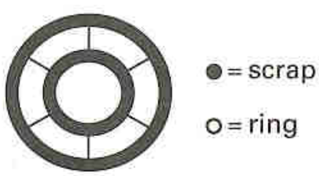


Type 7 (Tangential Grain)

Cost Considerations: Since Type 7 rings are manufactured to specific diameter, the scrap is very small, in the order of 15% or less. Type 6 rings, however, are cut from a sheet leaving a hole in the center that is usually discarded. The scrap rate of a Type 6 ring can approach 50% for a normal size transformer ring.



Type 6



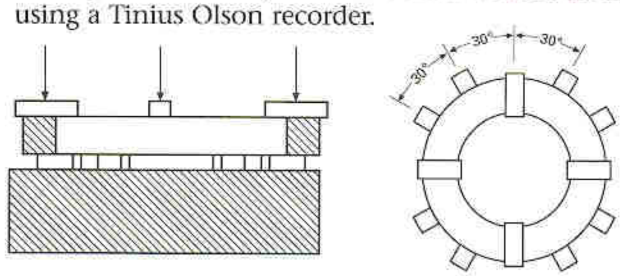
Type 7

Testing and Results:

Scope: To determine the differences in mechanical performance between Type 6 and Type 7 pressure rings, 18 rings were manufactured and tested using a mock-up of an actual transformer installation. Three rings of each type were made from three different thicknesses: 1-inch, 1.5-inches and 2-inches.

Test samples: Each ring was 27 inches in diameter with twelve 1.5"-wide hi-density pressboard blocks used to simulate radial spacer columns. Spacer blocks were placed at 30° intervals except where the load was applied where the spacing was 60°. The load was applied between the blocks spaced 60° to simulate a lead exit or a span under the yoke area.

The load was applied evenly to the four pressure blocks until interlamination fracture using a Tinius Olson super L compression tester, with deflection vs. load measured using a Tinius Olson recorder.



Results: In all cases the Type 7 rings demonstrated higher flexural strength than Type 6 rings. Modulus of elasticity results which were calculated from the Load vs Deflection recorder showed an even more marked difference.

Ring Thickness	Type 7 Rel Load	Type 6 Rel Load	Type 7 Rel MOE	Type 6 Rel MOE
1.00	1.00	.674	1.00	.57
1.5	1.00	.90	1.00	.60
2.0	1.00	.99	1.00	.70

Conclusions: The test results show a marked reduction in MOE when Type 7 and Type 6 rings are compared with Type 7 rings being much higher. This is even more significant than the higher Flexural Strength exhibited by the Type 7 rings.

To overcome the reduction in Modulus of Elasticity, a Type 6 ring would have to be at least 43% thicker than a Type 7 Ring for equal stiffness. (MOE is a predictor of how much the ring will flex under load, and in a transformer application, stiffness is critical to prevent movement in the windings under short circuit conditions.)

Thicker rings require more core steel in the window area, making the unit higher which affects such items as oil, steel, etc.

Therefore, Type 6 rings are not recommended as a cost effective alternative for applications where ring strength and stiffness is a concern.

Allan Bartek, P.E.
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